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None

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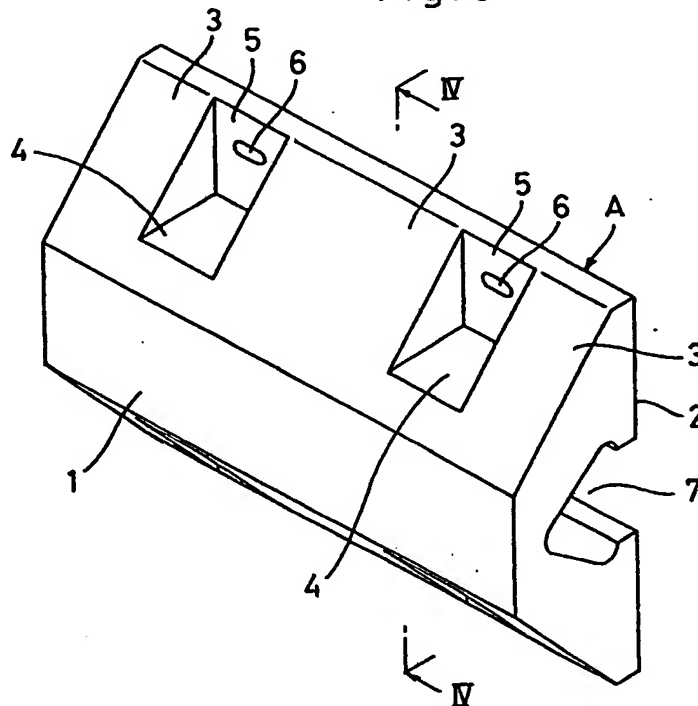
Selected US specifications from IPC sub-classes

E02B F16F

(54) Fender

(57) A fender has a plurality of inclined surfaces (3) extending at an angle of 45° or less with respect to an impact receiving surface (1) which comes in contact with the gunwale of a vessel. These inclined surfaces (3) are adapted to restrain a vessel from running on the upper surface of the fender and from strongly thrusting the lower surface thereof. The fender has footings (4) between adjacent inclined surfaces (3) at right angles to a mounting surface. Such footings (4) enable a person to go up and down between the deck of a vessel and the land.

Fig. 3



The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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Fig. 1

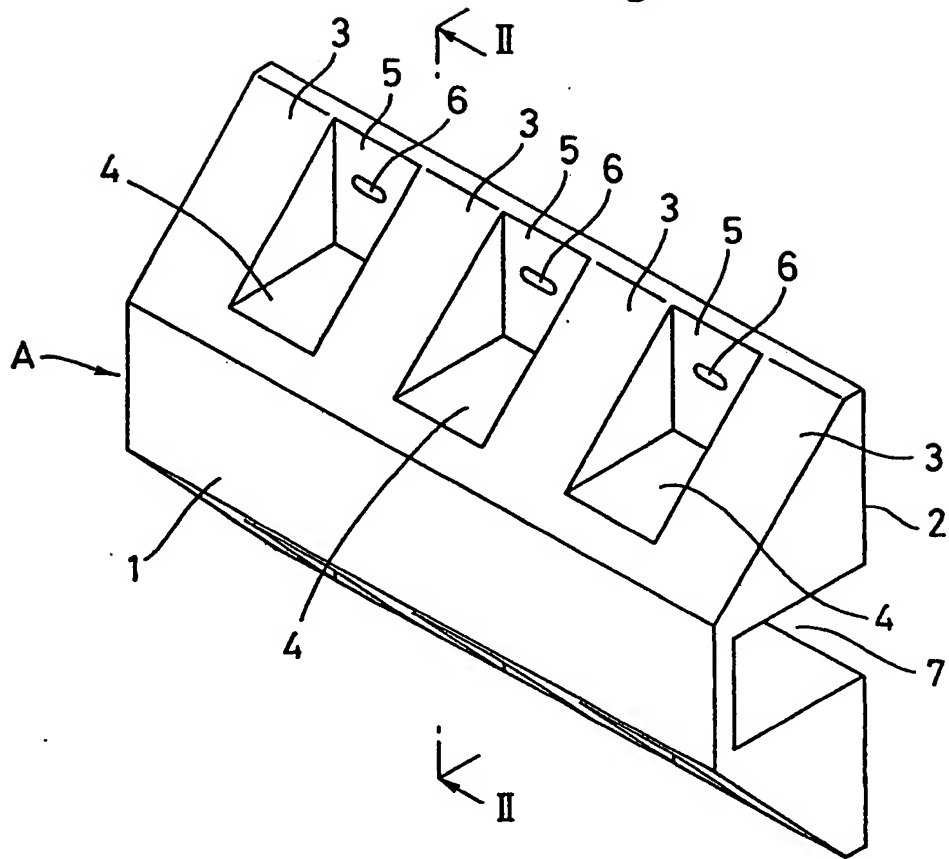
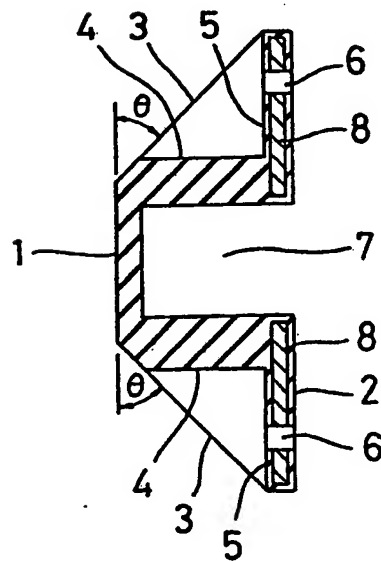


Fig. 2



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Fig. 3

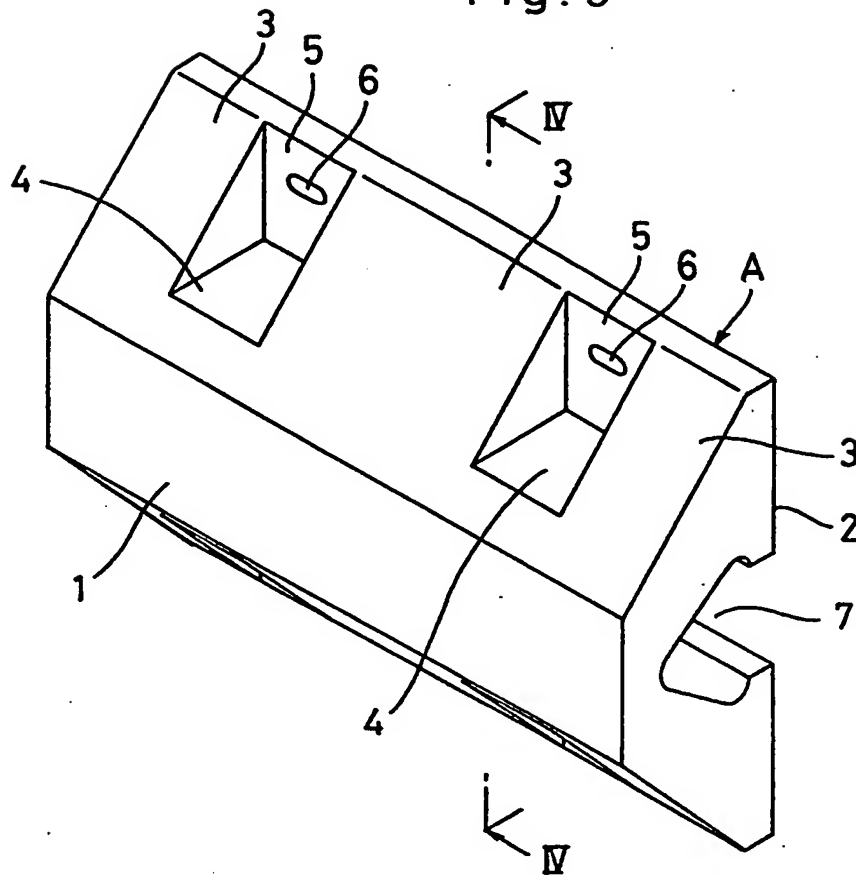


Fig. 4

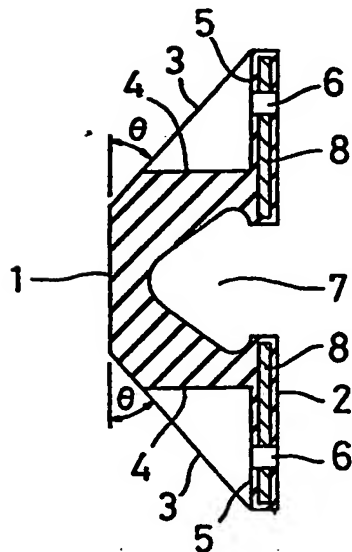
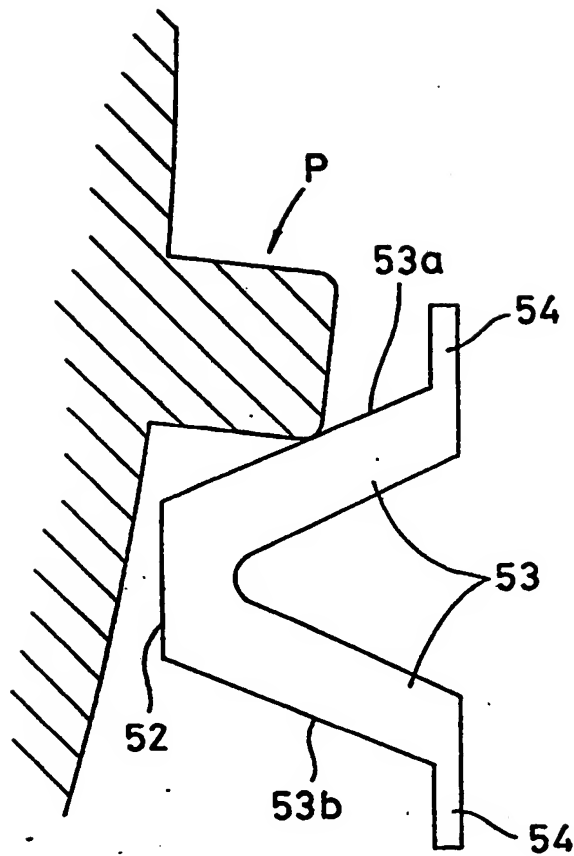


Fig. 5




## Specification

### Title of the Invention

Fender

### Background of the Invention

5     The present invention relates to a fender, and more particularly to a fender which is mounted on a quay alongside of which small-size vessels such as fishing boats or lighters are to come, with the object of preventing the hulls and the quay from being damaged due to  
10 the collision of the vessels with the quay.

Small-size vessels such as fishing boats or lighters may come into collision with a quay when such vessels are coming alongside of such a quay. Or, while being moored to a quay, such vessels may roll and/or  
15 pitch under the influence of waves or the like, causing the same to come into collision with the quay. Such a collision may damage the hulls and/or the quay. As a fender for preventing such damage to the hulls or quay, there is known a long-size fender of rubber having a  
20 section in the form of  or a V-shape section.



For example, a V-shape fender disclosed in Japanese Patent No. 1065186 has an impact support member 53 having a V-shape section provided with an impact re-

ceiving top surface 52 as a gunwale contact surface, and mounting portions 54 attached to the ends of the impact support member 53, the mounting portions 54 being in parallel to the impact receiving top surface 52, as 5 shown in Fig. 5.

Such a fender is horizontally or vertically secured to a quay at a predetermined position thereof. The impact support member 53 is adapted to receive load resulting from the contact with the gunwale of a vessel, 10 thereby to absorb the impact force. This prevents damage to a vessel or the quay.

However, when the fender is horizontally attached, the inclination angles of the upper surface 53a and the lower surface 53b of the impact support member 53 with 15 respect to the water surface are small since these upper and lower surfaces 53a and 53b are opened at a small angle. On the other hand, a band-shape projection P or other projections are attached to the gunwale of a vessel in a manner projecting therefrom, for the purpose of 20 reinforcement of the hull or the like. As shown in Fig. 5, such projections may run on the upper surface 53a of the impact support member 53 or may thrust the lower surface 53b thereof, under the influence of waves or a difference in tide level. The fender has a limited resilient deformability in the perpendicular direction, 25

i.e., in the vertical direction of the impact support member 53. Accordingly, the fender has a limited ability of absorbing the impact resulting from such running-on or thrusting of the projection P or the like. Therefore, 5 the impact exerted on the fender in the vertical direction thereof by the projection P or the like may cause the fender to be damaged or to fall off from the quay.

On the other hand, when the fender having a section in the form of  is horizontally attached, the upper 10 and lower surfaces of the impact support member are parallel to the water surface. Accordingly, if a vessel or the like is pitched, the impact by the projection P or the like may be exerted to the fender more strongly than in the fender having a V-shape section. Thus, the fender 15 having a section in the form of  may be damaged or fall off from a quay more easily than in the fender having a V-shape section.

In stevedoring such as unloading of cargo, there are instances where the land level of a quay is much 20 higher than the deck of a vessel at low tide. In such a case, it is not possible for stevedores to go up and down between the deck and the land unless footings are disposed on the quay. If such footings are not available, the workers may go up and down with their feet put 25 on the fender. If the fender has a V-shape section, the

upper surface 53a of the impact support member 53 is inclined. This causes the workers to easily slip, incurring danger. This presents a serious inconvenience for stevedoring.

## 5 Summary of the Invention

It is an object of the present invention to provide a fender which is prevented from being damaged or falling off due to an impact exerted by a vessel in a vertical direction.

10 It is another object of the present invention to provide a fender which is convenient for stevedoring in which workers go up and down between a vessel and the land.

In order to achieve the objects above-mentioned,  
15 the present invention provides a fender which prevents a vessel from coming into collision with a quay when the vessel is coming alongside the quay, which reduces an impact exerted to the fender particularly if the vessel is pitched, and which has footings to be used at a time  
20 of stevedoring.

The fender in accordance with the present invention comprises:

an impact receiving surface adapted to come in contact with the gunwale of a vessel and extending in a  
25 horizontal direction;



a mounting surface in parallel or substantially in parallel to the impact receiving surface;

a plurality of inclined surfaces extending from the upper and lower edges of the impact receiving surface 5 toward the mounting surface, the inclined surfaces being inclined at an angle of  $45^\circ$  or less with respect to the impact receiving surface; and

footings formed between adjacent inclined surfaces of at least the upper-side inclined surfaces, the foot- 10 ings being at right angles or substantially at right angles to the mounting surface.

In accordance with the fender having the arrangement above-mentioned, the upper and lower inclined surfaces extend from the upper and lower edges of the im- 15 pact receiving surface toward the mounting surface at an angle of  $45^\circ$  or less with respect to the impact receiving surface. Accordingly, even though the projections on the gunwale or the like of a vessel run on or thrust the fender under the influence of waves or the 20 like, these inclined surfaces cause the projections to slide therealong. This reduces the impact force exerted to the fender by the projections when the projections come into collision with the fender.

The footings are formed between adjacent inclined 25 surfaces at the upper surface at right angles or sub-

stantially right angles to the mounting surface. Accordingly, even though there is a great difference in level between the land and the vessel deck at a time of low tide or in the case of a small-size vessel, stevedores may go and down between the vessel and the land with the use of the footings. This facilitates stevedoring.

#### **Brief Description of the Drawings**

Figure 1 is a perspective view of a fender in accordance with a first embodiment of the present invention;  
10

Figure 2 is a section view taken along the line II-II in Fig. 1;

Figure 3 is a perspective view of a fender in accordance with a second embodiment of the present invention;  
15

Figure 4 is a section view taken along the line IV-IV in Fig. 3; and

Figure 5 is a side view of a conventional fender.

#### **Detailed Description of the Embodiments**

20 Fig. 1 is a perspective view of the fender in accordance with a first embodiment of the present invention.

A rubber fender A comprises:

an impact receiving flat surface 1 adapted to come  
25 in contact with the gunwale of a vessel and extending in

a horizontal direction;

a mounting surface 2 adapted to be mounted on and along a quay or the like, the mounting surface 2 being in parallel or substantially in parallel to the impact receiving surface 1;

a plurality of inclined surfaces 3 extending from the upper and lower edges of the impact receiving surface 1 toward the mounting surface 2;

flat footings 4 formed between adjacent inclined surfaces 3 at both the upper and lower surfaces of the fender;

bolt mounting surfaces 5 connected to those ends of the footings 4 located at the side of the mounting surface 2;

bolt insertion holes 6 through which fixing bolts are to be inserted into the mounting surface 2, the bolt insertion holes 6 being formed in the bolt mounting surfaces 5 at predetermined positions thereof;

a hollow portion 7 formed at the back of the impact receiving surface 1; and

iron plates 8 serving as reinforcing members embedded between the mounting surface 2 and the bolt mounting surface 5 (See Fig. 2).


More specifically, the upper end and the lower end of the mounting surface 2 vertically project consider-

ably with respect to the impact receiving surface 1. The mounting surface 2 is divided into two parts in the vertical direction by the hollow portion 7 and the inner end portions of the two parts respectively overlap the impact receiving section 1. As shown in 5 Fig. 2, the inclination angle  $\theta$  of the inclined surfaces 3 with respect to the impact receiving surface 1 is set to an angle of  $45^\circ$  or less such that the projections of a vessel are smoothly slid along the inclined surfaces 3 if such projections come in contact with the fender A in a vertical direction. Accordingly, the section 10 of the fender A at the inclined surfaces 3 is substantially in the form of a trapezoid.

The hollow portion 7 is concaved from the mounting surface 2 toward the impact receiving surface 1, and has a rectangular section. Accordingly, the hollow portion 15 7 permits the fender A to be resiliently deformed easily, and may resiliently absorb an impact exerted at a time when a vessel or the like comes into collision with the fender A. The hollow portion 7 may have a rectangular section as shown in Fig. 1 and may also have a spade- 20 shape section as shown in Fig. 3. By suitably selecting the hardness of rubber of the fender A, the fender A may be provided with a considerable resilient deformability. In such a case, the fender A is not required to have the hollow portion 7, but may be made in a solid structure.

25 The footings 4 formed between adjacent inclined

surfaces 3 are flat and at right angles or substantially right angles to the mounting surface 2. Each of the footings 4 has a width which allows a person to put his foot thereon.

5       The bolt mounting surfaces 5 are connected to those ends of the footings 4 located at the side of the mounting surface 2, and are parallel or substantially parallel to the mounting surface 2. Accordingly, the vertical section of the fender A at the footings 4 and the bolt  
10 mounting surfaces 5 are in the form of  as shown in Fig. 2.


The bolt mounting surfaces 5 have the bolt insertion holes 6 which pierce through the bolt mounting surfaces 5, reinforcing iron plates 8 and the mounting surface 2, the iron plates 8 being incorporated between the  
15 face 2, the iron plates 8 being incorporated between the surfaces 5 and 2. The fender A may be secured to a quay or the like by securing bolts which have passed through the bolt insertion holes 6, to such quay or the like.

The fender A is horizontally attached to a concrete  
20 quay or the like. If a vessel or the like comes into collision with the fender A at the impact receiving surface 1 thereof when the vessel or the like is coming alongside the quay, the fender A is resiliently deformed toward the quay to absorb the impact.

25       If a vessel or the like is pitched under the influ-

ence of waves while the vessel or the like is moored at a quay, the projections or the like on the gunwale of the vessel may run on or thrust the fender A. Since the fender A has at the upper and lower surfaces thereof a plurality of inclined surfaces 3 inclined at an angle of 45° or less with respect to the impact receiving surfaces 1, the projections or the like are slid along the inclined surfaces 3. This prevents the fender A from being strongly exerted by an impact by the projections or the like when the same come into collision with the fender A.

Further, even though there is a great difference in level between the land and the vessel deck for example at a time of low tide or in the case of a small-size vessel, it is possible for a person to go up and down between the vessel and the land through the fender with the use of the footings 4. This facilitates stevedoring.

The arrangement of the fender in accordance with the present invention is not limited to those shown in the embodiments above-mentioned. For example as to the inclined surfaces 3, a plurality of members each having an inclined surface and a triangular section may be integrally joined to a fender body having a section in the form of  at suitable spacial intervals. The respective component elements of the fender of the present

invention may be modified and changed without departing from the scope of the appended claims.

The fender having the arrangement above-mentioned in accordance with the present invention may sufficiently reduce an impact exerted by a vessel when the same is horizontally moved. This not only protects the vessel, but also prevents the quay from being damaged. In addition, the fender of the the present invention assures the following operational effects:

10       (1) The fender is provided at the upper and lower surface thereof with inclined surfaces. Accordingly, even though the projections projecting from a vessel gunwale run on or thrust the fender under the influence of waves or the like, the inclined surfaces enable the  
15 projections to slide therealong. This gradually reduces the impact exerted by the projections, thereby to prevent the fender from falling off or being damaged.

      (2) The fender is provided with footings between adjacent inclined surfaces at at least the upper surface  
20 thereof. With the use of the footings, stevedoring can be easily made even though there is a great difference in level between the land and the vessel deck for example at a time of low tide or in the case of a small-size vessel.

25       As described in detail, the fender in accordance

with the present invention reduces an impact exerted by  
a vessel when it comes into collision with a quay or the  
like, thereby to protect the vessel and the quay or the  
like. The fender also prevents damage to the fender  
5 itself due to the influence of waves, such damage re-  
maining unsettled in a conventional fender. Further, the  
fender of the present invention facilitates stevedoring  
with the use of the footings. Thus, the present inven-  
tion may achieve various practical effects which have  
10 not been obtained by a conventional fender.



**What is Claimed is:**

**1. A fender comprising:**

an impact receiving surface adapted to come in contact with the gunwale of a vessel and extending in a horizontal direction;

a mounting surface in parallel or substantially in parallel to said impact receiving surface;

a plurality of inclined surfaces extending from the upper and lower edges of said impact receiving surface toward said mounting surface, said inclined surfaces being inclined at an angle of 45° or less with respect to said impact receiving surface; and

footings formed between adjacent inclined surfaces at at least the upper surface of the fender, said footings being at right angles or substantially right angles to said mounting surface.

2. A fender according to Claim 1, wherein a hollow portion is formed at the back side of the impact receiving surface.

3. A fender according to Claim 1, having a solid structure.

4. A fender according to Claim 1, having a trapezoid section at the inclined portions thereof.

5. A fender according to Claim 1, further having bolt mounting surfaces located correspondingly to the

positions of the footings, which are being in parallel or substantially in parallel to the mounting surface, each of said bolt mounting surfaces having a bolt insertion hole which pierces into said mounting surface.

5     6. A fender according to Claim 5, wherein a reinforcing member is incorporated between the bolt mounting surfaces and the mounting surface.

7. A fender substantially as hereinbefore described, with reference to the accompanying drawings.